

POSTER PRESENTATION

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Relative low flow extra corporeal CO₂-removal in ARDS patients: a pilot study

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Introduction

Mechanical ventilation (MV) of patients with Acute Respiratory Distress Syndrome (ARDS) should be performed with a lung protective strategy, since this is associated with better clinical outcomes. Lung protective MV contains the lowering of the plateau pressure (P_{PLAT}) and the tidal volume (V_T). Physician's choice for lung protective MV can be hindered by the consequence of decreased CO₂ clearance, i.e. respiratory acidosis.

Veno-venous extracorporeal CO₂-removal (ECCO₂-R) is a recent therapy allowing extracorporeal CO₂ clearance and normalisation of pH.

Objectives

The aim of this pilot study was to evaluate whether ECCO₂-R using relative low blood flow was able to treat respiratory acidosis in ARDS patients treated with lung protective MV, so that further reduction of P_{PLAT} and V_T was feasible.

Methods

This is a single centre trial in which patients who met the Berlin definition of ARDS with a $PaO_2/FiO_2 < 150$ mmHg and who had respiratory acidosis were included. The first 2 hours of therapy blood flow was 300 ml/min, after which it was increased to 400 ml/min. During the ECCO₂-R we aimed at lowering P_{PLAT} and V_T . For every patient we used the Abylcap[®] device (Bellco, Italy) with either the Lynda[®] machine (8 patients) or the Amplat[™] (1 patient). Every patient was heparinized to prevent clotting of the circuit and oxygenator. During the complete study period, ventilator settings and results of blood gases were recorded. Data are reported as median [interquartile range] or n (%).

Results

We included 9 patients, 4 female, with a median age of 50 y [22.8, 66.5]. All patients showed a decrease of pCO₂ after 2 hours of treatment with median reduction of 28.2% [11.6, 31.0; $p = 0.008$]; five patients (56%) had a decrease in pCO₂ of more than 20%. The median reduction in P_{PLAT} after 5 days (D5) of treatment was 8.5 cmH₂O (5.3, 12.5; $p = 0.012$). Median reduction in V_T at D5 was 1.52 ml/kg predicted body weight (0.65, 1.85; $p = 0.017$). In all patients pH could be corrected to normal range values with an increase of median pH from 7.17 (7.11, 7.21) at inclusion to 7.42 (7.40, 7.44) ($p = 0.012$) at D5. ECCO₂-R was hemodynamically well tolerated. Three patients needed a blood transfusion because of bleeding. Two patients needed a circuit renewal earlier than scheduled because of clotting of the circuit or oxygenator, both patients were treated with the Lynda[®] machine.

Conclusions

In patients with moderate ARDS, veno-venous ECCO₂-R using relative low blood flow is a promising extracorporeal technique allowing removal of CO₂, thus allowing MV with lower P_{PLAT} and V_T . An explanation for the inter-patient variation in efficiency of CO₂ removal could not be found in our patient cohort.

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